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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 : G07C 5/10, B60Q 9/00 — A1

(11) International Publication Number: WO 86/ 06190

(43) International Publication Date: 23 October 1986 (23.10.86)

(21) International Application Number: PCT/EP86/00197

(22) International Filing Date: 2 April 1986 (02.04.86)

(31) Priority Application Number: 8509488

(32) Priority Date: 12 April 1985 (12.04.85)

(33) Priority Country: GB

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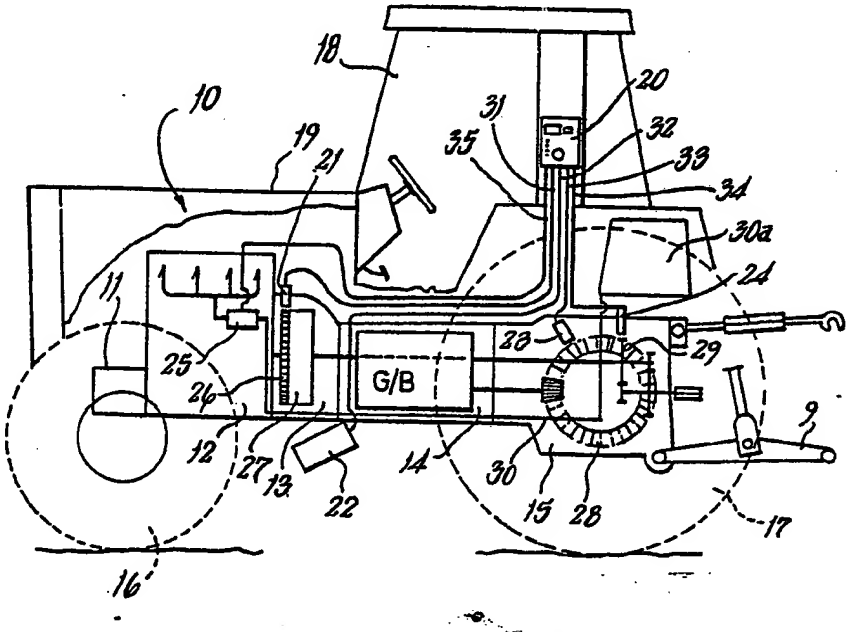
(81) Designated States: AT (European patent), AU, BE (European patent), BR, CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.

Published
With international search report.

(54) Title: VEHICLE PERFORMANCE MONITORING APPARATUS

(57) Abstract

A vehicle performance monitoring apparatus (20) for displaying the values of a plurality of performance parameters of a vehicle (10). The apparatus includes sensors (21, 22, 23, 24, 25) for sensing data indicative of the performance of the vehicle, processing means (40, 42) for processing this data to provide the parameter values, display means (35) for displaying said parameter values, and operator command means (37, 38) for controlling the operation of the apparatus including the selection of which performance parameter is to be displayed on the display means and the initiation of processing routines by the processing means. Additionally the apparatus includes mem ry means (43, 44, 45) for storing performance information relating to the performance parameters and th processing means (40, 42) is arranged in response to a predetermined operation of the operator command means (37, 38) to store in the memory means (43, 44, 45) a performance parameter value for each of a number of so-called relative mode parameters. These stored values are used as reference values so that subsequently, when the apparatus is perated in so-called relative mode, the current performance parameter values for the relative mode parameters are processed by the processing means (40, 42) and are each displayable on the display means (35) as proportions (e.g. percentages) of their respective reference value.



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VEHICLE PERFORMANCE MONITORING APPARATUS

Technical Field

This invention relates to vehicle performance monitors and particularly, though not exclusively, to such monitors for use in vehicles such as agricultural and industrial tractors, combines and the like.

In the current environment of ever increasing vehicle operating costs, there is an increasing requirement for the provision of more detailed monitoring of vehicle operating performance in order to enable the vehicle operator to ensure a more cost effective operation of the vehicle.

Disclosure of the Invention

It is an object of the present invention to provide an improved form of vehicle performance monitor which is particularly suitable for use in agricultural tractors and like vehicles.

Thus according to the present invention there is provided a vehicle performance monitoring apparatus for displaying the values of a plurality of performance parameters of a vehicle, said apparatus comprising sensing means for sensing data indicative of the performance of the vehicle, processing means for processing said data to provide said parameter values, display means for displaying said parameter values, and operator command means for controlling the operation of the apparatus including the selection of which performance parameter is to be displayed on the display means and the initiation of processing routines by the processing means, the apparatus being characterised by including memory means for storing performance information relating to said parameters and that said processing means is arranged such that in response to a predetermined operation of the op rator command means a p rformance parameter value for ach of a numb r of said parameters is st r d in said m mory means as a ref rence value s that subsegu ntly, when the apparatus is op rated in a relative

mode, th current performance values for said one r mor parameters (hereinafter referred to as the relative mode parameters) are processed by said processing means and are displayable on said display means as proportions of their respective reference values.

It is envisaged that the stored reference values will be generated by the processing means in response to the predetermined operation of the operator command means by taking the average value of the performance data coming from the appropriate sensors over a time period of say two seconds. This will guard against spurious readings due to short duration fluctuations in the data coming from the sensors.

The memory means may conveniently include memory locations (hereinafter referred to as the reference table memory locations) in which the last generated/current reference values of the relative mode parameters are stored and separate memory locations (hereinafter referred to as the scratch table memory locations) where performance parameter data on the relative mode parameters is accumulated or temporarily stored during the generation of a new set of reference values.

In a preferred arrangement in order for the operator to initiate the generation of a new set of reference valves he is required to continuously maintain a given operation of the command means (e.g. hold down a button) for a significant initiating time period of say two seconds to prevent accidental generation of new reference values. Thus to gen rate new referenc values the operator operates th command means for two sec nds and at th end f this two second period provided th operator continu s to operate the command means, the apparatus commenc s th gen ration f th

new reference values by sampling the sensors over the next two second period to generate the average values of the relative mode parameters. Thus the entire generation of the new reference values takes four seconds at the end of this time the new reference values are copied into the reference table memory locations for future use.

As will be clear from the above, if the operator releases the command means before completion of the above four second period generation of new reference values is either not commenced or if commenced not completed. In either event, as will be discussed in greater detail below, the apparatus will continue to use the previously generated reference values.

Conveniently, the monitoring apparatus can be configured so that immediately the regeneration of new reference values has been completed the apparatus automatically operates in the relative mode. The apparatus is switchable by the operator command means between the relative mode in which the current values of the relative mode parameters are displayable relative to the reference values (for example as percentages) and the normal mode in which the actual current values of all the displayable parameters are displayable.

In a typical installation in accordance with the present invention applied to on agricultural tractor, examples of relative mode performance parameters are:-

Vehicle Speed
Fuel/Area Worked
Fuel/Hour
Area Worked/Hour
Engine Speed
PTO Speed

Thus if, for example, an operator is using an agricultural tractor in a field and wishes to know the effect on one or more of the above listed relative mode parameters of say a change in throttle opening or gear ratio,the operator would:-

1. Make said predetermined operation of the operator command means to store reference values for the relative mode parameters in said memory means.

2. Change the throttle setting or gear ratio as desired.

3. View the current values of the relative mode parameters on the display means in the relative mode. These current values will be displayed as proportions (e.g. percentages) of the reference values.

Thus if, for example, the effect of the change in throttle opening and/or gear ratio was to increase fuel comsumption/hour by say 5% the display means would display "r 105" if the fuel/hour parameter was selected for display by the operator. [The "r" indicating and warning that the apparatus is operating in the relative mode]. Clearly such information is an invaluable tool to the operator in ensuring the economical operation of the tractor.

Description of the Drawings

One embodiment of the present invention as applied to a monitoring apparatus for use on an agricultural tractor will now be described, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic representation of an agricultural tractor fitted with a monitoring apparatus in accordance with the present invention;

Figure 2 is an exterior view on a larger scale of the main unit of the monitoring apparatus;

Figure 3 is a block diagram of the hardware of the main unit;

Figure 4 is a flow diagram showing the logic loops used in the recalculation of reference values for the relative mode performance parameters, and

Figure 5 is a diagrammatic representation on a time basis of the operating sequence of various parts of the monitoring apparatus.

Referring to Figure 1, the tractor 10 comprises a chassis built up from a series arrangement of castings constituted by a front axle support 11, an engine block 12, a clutch housing 13, a gearbox housing 14 and a back axle housing 15. The chassis is supported on front and rear wheels 16 and 17 respectively and carries a cab 18, an engine hood 19 and a rear three-point hitch 9 controlled by a hitch control system (not shown).

The monitoring apparatus comprises a main unit 20 and a number of performance sensors 21 to 25. In the example illustrated, the main unit 20 is mounted on the inside of one of the vertical cab posts, but it will be appreciated that the unit 20 could be mounted in any location convenient for the tractor operator.

In the particular example to be described the sensors provide data directly indicative of the following factors:-

Sensor Unit	Factor

21	Engine Speed
22	Actual Vehicle Speed
23	Theoretical Vehicle Speed
24	PTO Speed
25	Fuel Flow Rate.

Although the actual type of sensor used forms no part of the present invention, examples of suitable sensors will now be briefly discussed.

Sensor 21 is of the electro-magnetic type and is located adjacent the teeth 26 on the starter ring of the flywheel/clutch unit 27 so that as the teeth 26 pass the sensor a signal is generated by the sensor whose frequency is proportional to the speed of rotation of the flywheel and hence the engine speed.

Sensor 22 a is Doppler radar unit whose beam is directed in a downwardly sloping attitude and which provides a signal whose frequency is proportional to the actual speed of the vehicle over the ground in the known manner.

Sensors 23 and 24 are of a similar electro-magnetic type to sensor 21 and are respectively associated with crownwheel teeth 28 and PTO drive gear teeth 29 thus respectively providing signals proportional to the actual speed of rotation of the r ar driving wh els 17 (i.e. proportional to the theoretical speed of the vehicle) and the PTO shaft rotational spe d.

Fuel flow sensor 25 is of the electro-magnetic type in which the speed of rotation of a small turbine element disposed in the fuel line 30 from a fuel tank 30a is measured to provide signals proportional to the fuel flow rate. Alternatively, in diesel engine applications the speed of movement of various parts of the diesel fuel injector pump can be monitored to provide signals proportional to fuel flow rate.

The sensors 21 to 25 are connected with the main unit 20 via lines 31 to 35 respectively. An external view of the main unit 20 is shown on a larger scale in Figure 2.

Externally the unit 20 has a display means in the form of a four digit LCD display 35 and a vertical array of LED's 36 each with its own caption to indicate the performance parameter being displayed on the LCD display. Figure 2 shows a typical selection of the parameters which might be monitored in an agricultural tractor application.

The unit is provided with operator command means in the form of a reset button 37 and rotary knob 38. The button 37 and knob 38 constitute multi-function controls for the monitoring apparatus which, in addition to the functions which will be described below in relation to the present invention, also allow the operator to perform other functions such as:-

1) Resetting the accumulated data on a given displayed parameter to zero or any other positive value.

2) Setting a given performance reference value to be used as a warning threshold on certain parameters (e.g. a level of slip above which a warning should be given or corrective action taken).

3) Inputting data (e.g. implement width) required in calculations made by the monitoring apparatus to calculate certain displayed parameters (e.g. Fuel/Area worked).

The hardware of the main unit 20 is shown diagrammatically in Figure 3 and is largely self-explanatory.
At the heart of the unit is the processing means constituted by a microprocessor 40 and its associated PROM 42.
Processor 40 communicates with PROM 42 and RAM 43 via bus 41. RAM 43, as will be referred to later below, includes reference table memory locations 44 and scratch table memory locations 45.

Processor 40 also communicates via bus 46 with as sensor interface 47 which converts the signals coming from sensors 21 to 24 into signals which can be read and processed by the processor 40. The reset button 37 and control 38 are shown diagrammatically in Figure 3 as the switch inputs box 48.

The LCD display output 35 and LED indicator lights 36 are shown diagrammatically in Figure 3 by output box 50 which communicates with processor 40 via bus 49.

The hardware of the performance monitor is completed by the power supply 53 which has tappings for a variety of voltages required by different parts of the circuity of the monitor.

In the particular version of the tractor performance monitor being described the following relative mode performance parameters are implem nted:-

Vehicle Speed
Fuel/Ar a Worked

Fuel/Hour
Area Worked/Hour
Engine Speed
PTO Speed

As will be evident, these relative mode parameters (and indeed the non-relative mode parameters) are basically of two types. A first type in which a sensor provides a signal which is proportional to the parameter to be displayed (e.g. vehicle speed and PTO speed) and the processing means does no more than turn the sensor signals into displayable readings and a second type in which the processing means is also called upon to do some mathematical calculation and/or operate on more than one sensor signal [e.g. "fuel/area worked" where the processing means in addition to providing a fuel comsumption figure is also called upon tc calculate the area worked from the data indicating the distance travelled (derived from the signal from radar unit 22) and the width of the implement being used (which is an operator input as referred to briefly above)].

Another example of a performance parameter which requires the processing means to operate on more than one sensor signal and perform mathematical calculations is the wheel slip parameter which requires the processing means to perform calculations on the actual vehicle speed and the theoretical vehicle speed signals in the known manner to provide, for example, a percentage wheel slip display capability.

Operation of a tractor performance monitor of the form described above will now b described with reference to Figures 4 and 5.

Assuming that the tractor is b ing operated in a field and

the operator wishes to know the effect of changing, for example, the engine throttle setting on the relative mode performance parameters the operator would ensure that the currently stored reference values reflect the current operating conditions of the tractor by undertaking the following procedure.

Firstly, the selector knob 38 is rotated clockwise or anti-clockwise to ensure that the monitor is displaying one of the six relative mode performance parameters itemised above. The operator then depresses the reset button 37. For the first two seconds of the depression of the reset button 37 the LCD display 35 goes blank. This is a waiting/decision period to ensure that the operator really does require the tractor performance monitor to go through a recalculation process for the reference values of the six relative mode parameters.

Assuming that the operator continues to depress the reset button after the two second decision period the recalculation of the reference values is initiated and the LCD display displays a chosen predetermined warning display (for example, "rrrr") to indicate that this recalculation is in progress. The recalculation process takes two seconds and at the end of this two second period, that is four seconds from the initial depress of the reset buttom 37, the LCD display automatically begins to display the instantaneous values of the currently selected performance parameter (indicated by the operative LED) as a percentage of the recalculated reference value. The initial display on LCD display 37 immediat ly after recalculation of th reference valu s is "r100". The "r" warns that the relative mode is operativ and the "100" indicates that the current paramet r value is the same as the new ref r nce value.

The operator now makes the required change to the throttle setting and assuming that the operator has selected the Fuel/Hour parameter for display and the effect of the change in throttle setting is to worsen the fuel consumption per hour by say 5%, the LCD display 35 will display the reading "r 105" after the throttle setting change has been made. If the operator wishes to view the effect of the change in throttle setting on any of the other five relative mode parameters the operator simply turns knob 38 to switch to the required relative mode parameter to obtain a relative mode percentage display.

The operator is free to switch between the relative mode display in which the current values of the six relative mode parameters are displayable as percentages of the reference values currently stored in the reference table memory locations as described above and the normal mode in which the actual current values of all the displayable parameters of the tractor performance monitor are displayable on the LCD display. This switching between the relative and normal modes is achieved by simply depressing the reset button 37 and releasing this button within the initial two second decision period described above. Each such brief depression of the reset button 37 switches from one mode to the other.

Figure 4 shows one form of logic diagram suitable for use in the recalculation if reference values in a monitoring system in accordance with the present invention. Referring to Figure 4, it will be observed that this provides a logic loop 100 which is executed every half a second. This time period is chosen to correspond with the time period for updating of the LCD display 35 which is also half a second in the exampl chosen.

When the system is recalculating the referenc values for the six relative mode parameters (see box C in Figure 4) it is arranged to do so by calculating the average value of each of the six parameters over the two second recalculation period. Since the logic loop of Figure 4 is executed every half a second the system in practice calculates the average value of each parameter for four consecutive half-second periods and then averages these four consecutive average values.

During the recalculation of the reference values, performance data on the relative mode parameters is accumulated/temporarily stored in the scratch table memory locations 45 at the end of the two second recalculation period the new reference values for the relative mode parameters are transfered from the scratch table memory locations 45 to the reference table memory locations 44 for subsequent use when displaying the parameters in the relative mode (see box D of Figure 4).

If the recalculation of the reference values is not successfully completed as a result of the operator removing his finger from the reset button 37 before the 4 second period is complete, the system is configured to ensure that the reference values stored in the reference table memory locations before the reset button was pressed are maintained in the reference table memory locations for future use.

This is achieved by the simple expedient of arranging that at the end of each successful or unsuccessful attempt to recalculate new reference values for the relative mode param t rs the valu s in th scratch table memory locations are always copied into the reference table memory locations (see box D in Figure 4) and in the vent of an unsuccessful attempt to recalculate n w reference values immediately

prior to the above step of box D, the reference table values are copied into the scratch table memory locations (see box E of Figure 4).

Decision box A of Figure 4 relates to the depression of reset button 37 to initiate a recalculation of the reference values of the relative mode parameters. Thus until the initial two second decision period has passed, that is until the fifth time round loop 100, the logic loop will exit from box A via the "NO" branch 101. On the fifth time round loop 100 the logic loop will exit from box A via the "YES" branch 102 to initiate recalculation of the reference values (see box C).

When the recalculation of the reference values is complete in the scratch table memory locations a "done" flag is set in the microprocessor and the next time round loop 100 the logic loop exits from box A via "NO" branch 101 to decision box B.

Box B relates to the successful recalculation of new reference values. Thus following the setting of a "done" flag the logic loop exits from box B via "YES" branch 103 so that the new reference values are transferred from the scratch table memory locations 45 into the reference table memory locations 44 (see box D).

When the logic loop exits from box B via the "NO" branch 104, which will occur should the operator release the reset button before the end of the four second period required to complete the recalculation of the reference values, the current values in the reference table memory locations 44 are copied into the scratch table memory locations 45 (see box E) and these reference values ar then copi d back into the reference table memory locations 44 (s e box D) to

ensure that the original reference values are maintained as described earlier above.

Figure 5 shows diagrammatically on a time basis the operating sequence for the reset button 37, the LCD display 35, the activity of microprocessor 40, and the status of the reference values in memory locations 44.

It will be appreciated from the above that the present invention provides an improved form of vehicle performance monitor which has the ability to store performance paramater values for the relative mode parameters and then to display the current performance parameter values as proportions of their respective reference values. This relative mode feature provides the operator with a particularly clear indication of the effect on the vehicle performance of changes in the vehicle operating settings.

CLAIMS

1. A vehicle performance monitoring apparatus (20) for displaying the values of a plurality of performance parameters of a vehicle (10), said apparatus comprising sensing means (21,22,23,24,25) means for sensing data indicative of the performance of the vehicle, processing means (4),42) for processing said data to provide said parameter values, display means (35) for displaying said parameter values, and operator command means (37,38) for controlling the operation of the apparatus including the selection of which performance parameter is to be displayed on the display means and the initiation of processing routines by the processing means, the apparatus being characterised by including memory means (43,44,45) for storing performance information relating to said parameters and that said processing means (40,42) is arranged so that in response to a predetermined operation of the operator command means (37,38) a performance parameter value for each of a number of said parameters is stored in said memory means (43,44,45) as a reference value so that subsequently, when the apparatus is operated in a relative mode, the current performance parameter values for said one or more parameters (hereinafter referred to as the relative mode parameters) are processed by said processing means (40,42) and are displayable on said display means (35) as proportions of their respective reference values.

2. An apparatus according to claim 1 characterised in that the stored reference values are generated by the processing means (40,42) taking the average value of the performanc data coming from the appropriate sensors (21,22,23,24,25) over a predetermined time period.

3. An apparatus according to claim 1 or 2 characterised in

that the memory means (43,44,45) includes reference table memory locations (44) in which the last generated or current reference values of the relative mode parameters are stored and separate scratch table memory locations (45) where performance parameter data on relative mode parameters is accumulated or temporarily stored during the generation of a new set of reference values.

4. An apparatus according to any one of claims 1 to 3 characterised in that in order to initiate generation of new reference values an operator must continuously maintain a given operation of the command means (37) for a significant initiating time period.

5. An apparatus according to claim 4 characterised in that in order to complete generation of new reference values the operator must continue to maintain said given operation of the command means (37) for a predetermined generation period after the end of the initiating time period.

6. An apparatus according to any one of claims 1 to 5 characterised in that immediately after the completion of the regeneration of new reference values the apparatus automatically operates in the relative mode.

7. An apparatus according to any one of claims 1 to 6 characterised in that the display means (35) displays a predetermined warning display (rrrr) during generation of a new set of reference values.

8. An apparatus according to any one of claims 1 to 7 characterised in that the display m ans (35) displays a warning symbol (r) when displaying a performance paramet r in the relative mode.

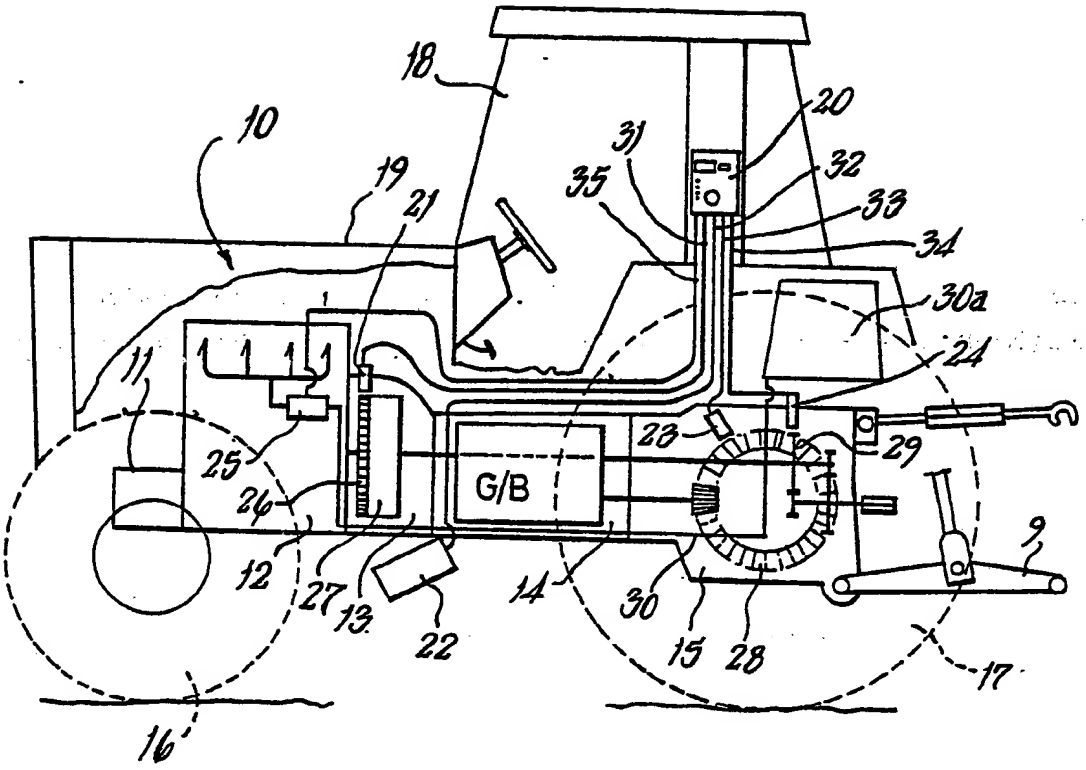

FIG.1

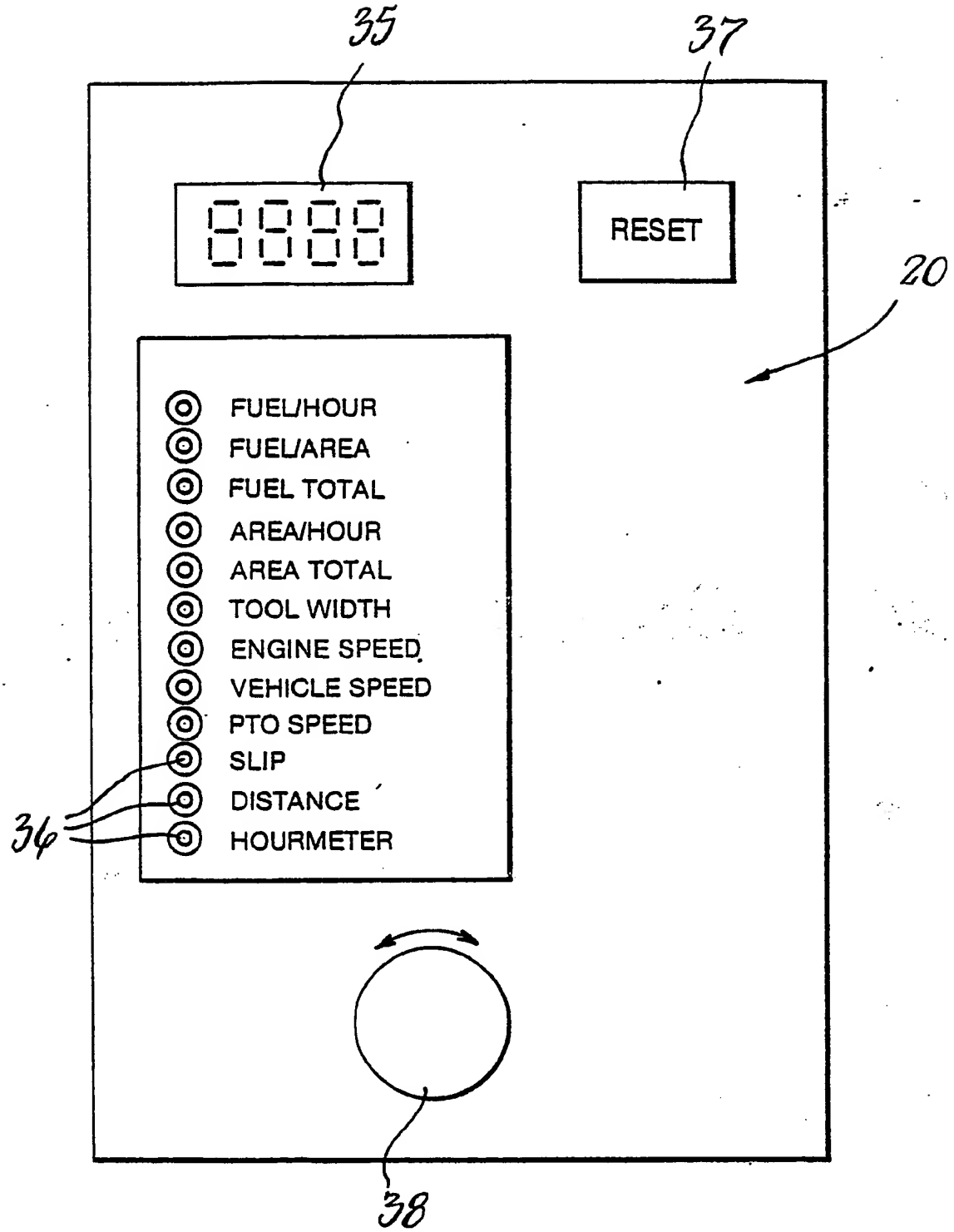

FIG.2

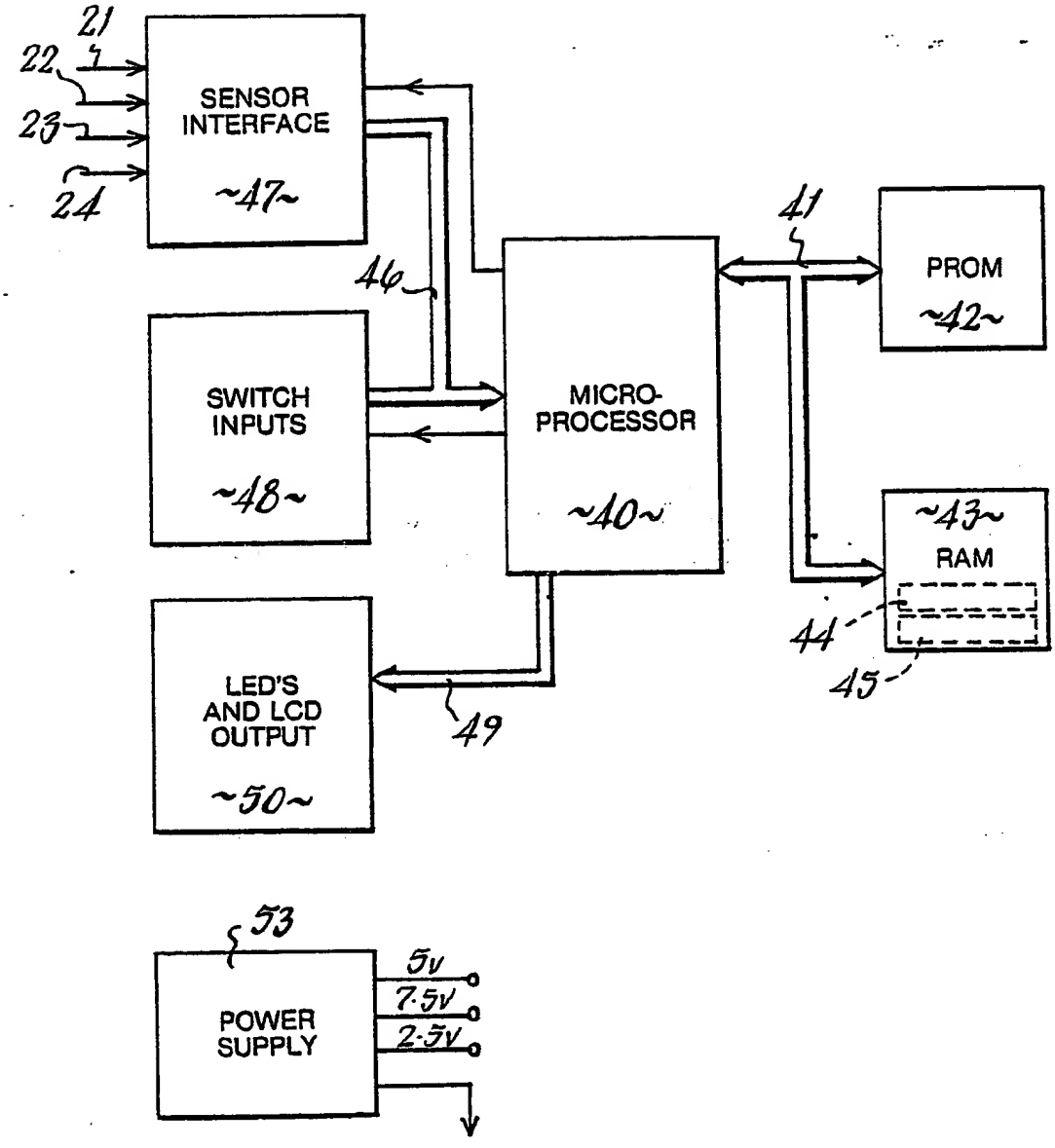

FIG.3

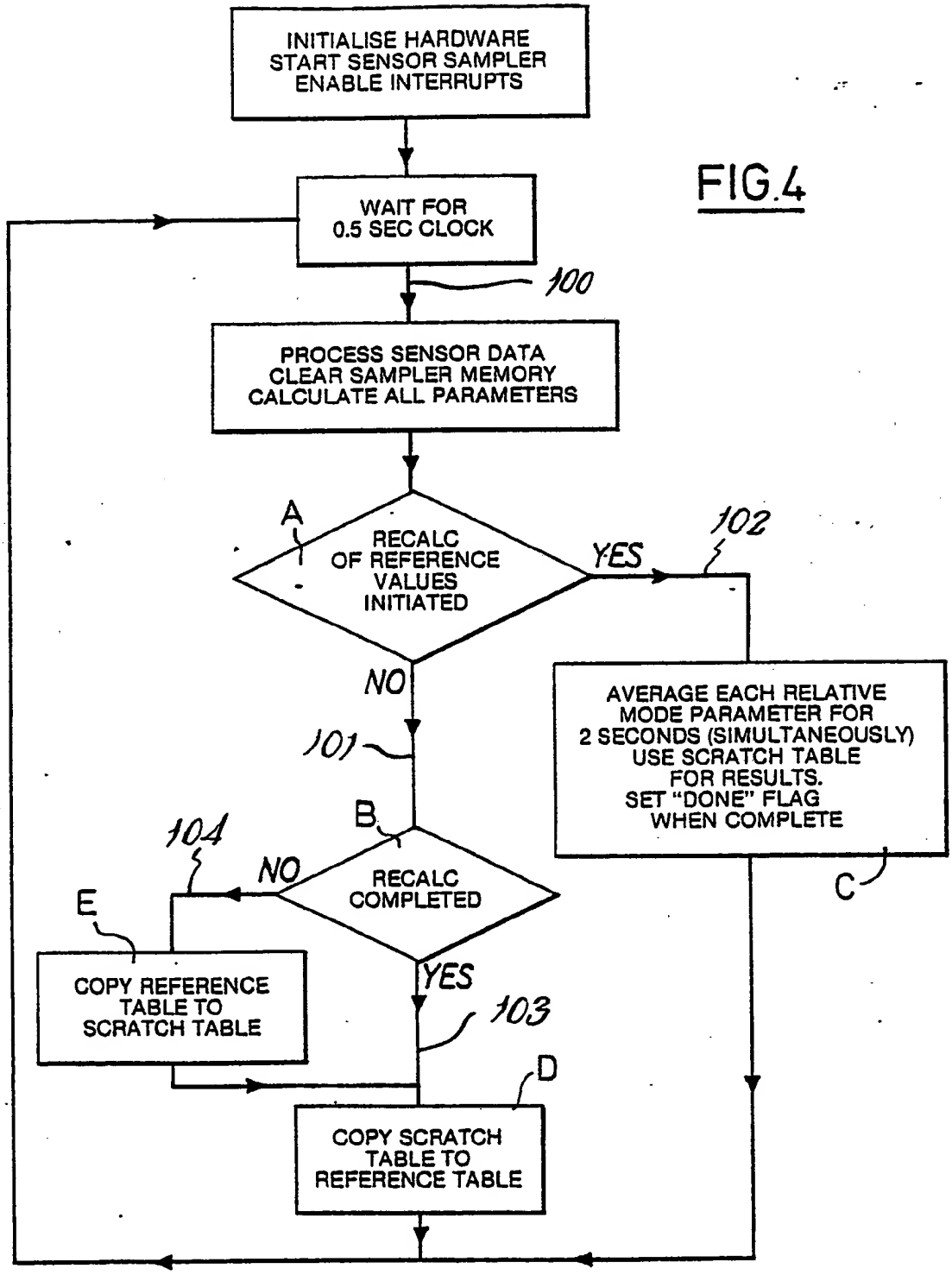

FIG.4

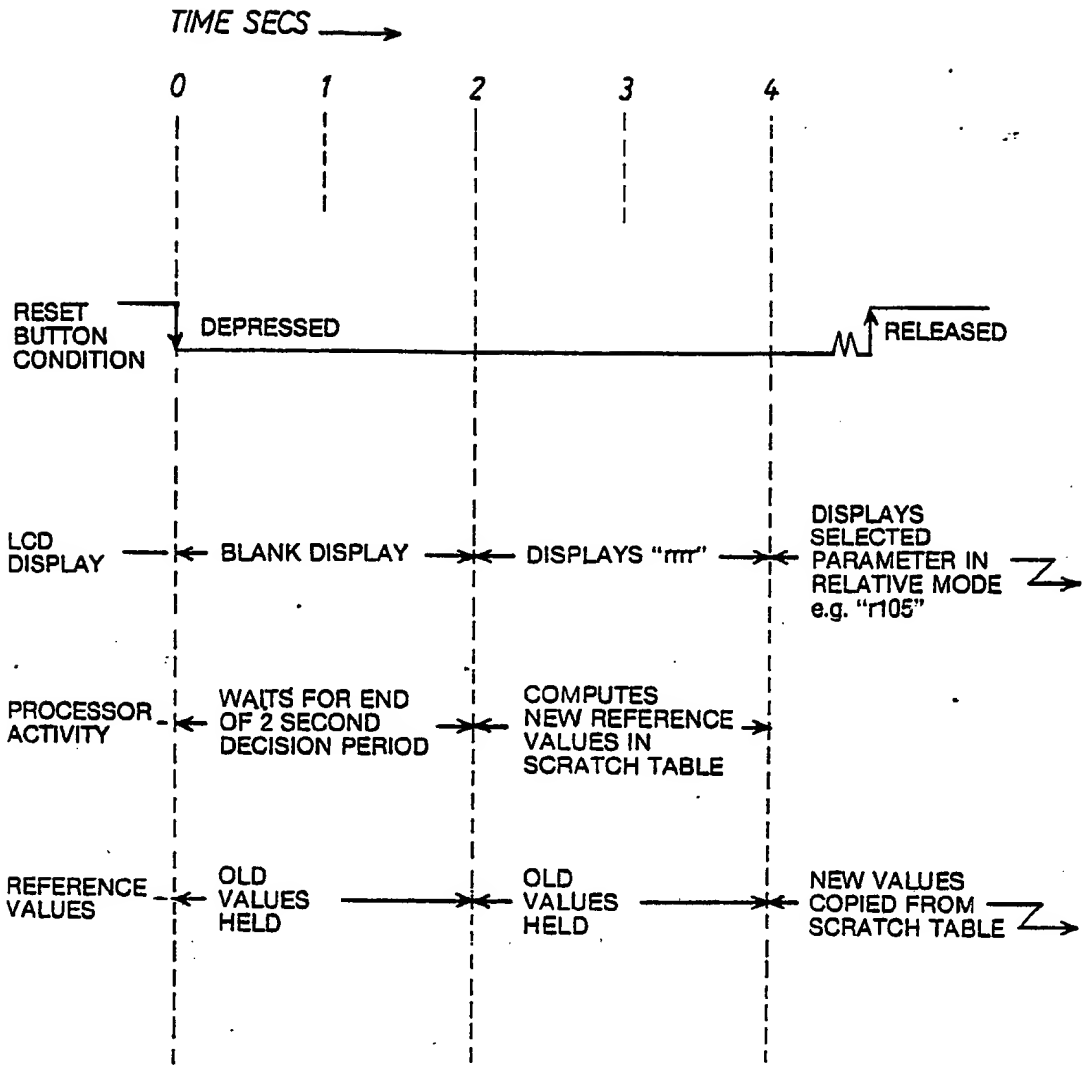

FIG.5

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 86/00197

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: G 07 C 5/10; B 60 Q 9/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	G 07 C; B 60 Q; G 06 F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y	WO, A, 82/01354 (MASSEY-FERGUSON) 29 April 1982, see page 7, line 29 - page 12, line 2; page 13, line 25 - page 14, line 10; page 19, line 27 - page 20, line 10; page 25, line 5 - page 26, line 14; claims; figures	1
A		2-4
	--	
Y	US, A, 4140996 (LEITCH et al.) 20 February 1979, see abstract; column 4, lines 29-42; claims; figures	1
A		8
	--	
A	US, A, 4419654 (FUNK) 6 December 1963, see abstract; column 1, line 64 - column 2, lines 35,51 - column 4, line 66; figures	1
	--	
A	EP, A, 0114018 (RENAULT) 25 July 1984, see claims; figures	1,2
	--	
A	US, A, 4296409 (WHITAKER) 20 October 1981, see abstract; figures	1,4 ./.

* Special categories of cited documents: [16]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
3rd July 1986	31 JUL 1986
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	M. VAN MOL

Form PCT/ISA/210 (second sheet) (January 1985)

International Application No. PCT/EP 86/00197

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4344136 (PANIK) 10 August 1982	
A	GB, A, 2002703 (BMW) 28 February 1979	
A	US, A, 4013875 (McGLYNN) 22 March 1977	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/EP 86/00197 (SA 12890)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 18/07/86

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO-A- 8201354	29/04/82	EP-A-	0070833	09/02/83
		AU-A-	7647481	11/05/82
		CA-A-	1180430	01/01/85
US-A- 4140996	20/02/79	None		
US-A- 4419654	06/12/83	None		
EP-A- 0114018	25/07/84	JP-A-	59128413	24/07/84
US-A- 4296409	20/10/81	None		
US-A- 4344136	10/08/82	FR-A,B	2460010	16/01/81
		DE-A-	2925131	08/01/81
		JP-A-	56005236	20/01/81
		SE-A-	8004578	23/12/80
GB-A- 2002703	28/02/79	FR-A,B	2400238	09/03/79
		DE-A,C	2736465	22/02/79
		JP-A-	54043052	05/04/79
		US-A-	4317106	23/02/82
		SE-A-	7808578	13/02/79
US-A- 4013875	22/03/77	US-A-	4072850	07/02/78